



Alaska Department of Environmental Conservation
Office of the State Veterinarian Fish Monitoring Program
5251 Dr. Martin Luther King Jr. Ave.
Anchorage, AK 99508
(907) 375-8200

ANALYTICAL RESULTS FOR TRACE ELEMENTS AND PER- AND POLYFLUOROALKYL SUBSTANCES IN FISH TISSUE SAMPLES

Analytical Analysis for metals performed by:
Alaska State Environmental Health Laboratory
5251 Dr. Martin Luther King Jr. Avenue
Anchorage, AK 99507
<http://dec.alaska.gov/eh/lab>

Analytical Analysis for perfluorinated compounds performed by:
SGS AXYS Analytical Services Ltd.
2045 Mills Road West
Sidney, BC, Canada V8L 5X2
<https://www.axysanalytical.com/>

Summary report prepared by:

Christoff Furin, PhD
Research Analyst III
Department of Environmental Conservation
Office of the State Veterinarian
christoff.furin@alaska.gov
(907) 375-8211

Report to: ADF&G

Sample Location(s): Ruth Burnett Sport Fish Hatchery and Polaris Lake

Analytes: As, Cd, Cu, Pb, Hg, Se, and PFAS (see below for list of compounds)

Date of Report: May 10, 2019

Narrative:

SAMPLES AND ANALYSIS:

Samples were received at the State Environmental Health Lab (EHL) on February 26, 2019. They were stored at -20°C and processed according to standard operation procedures (SOP) of the Fish Monitoring Program and EHL. Analytical analysis of total mercury in the fish tissue samples was performed according to EPA Method 7473 using a DMA-80 (Direct Mercury Analyzer). Arsenic, copper, selenium, cadmium and lead were analyzed using ICP/MS by EPA method 6020 after microwave assisted acid digestion (EPA 3051A). Standard EHL QA/QC procedures were followed.

Composite samples of both whole body and fillet tissues were made using 20 individuals from each species collected from the Ruth Burnett Sport Fish Hatchery (RBSFH). This resulted in four samples, rainbow trout: whole body and fillet, and arctic char: whole body and fillet. Samples from Polaris lake were processed likewise with composite samples of both tissues from 5 northern pike, 3 chinook salmon and 10 rainbow trout. A total of 12 composite samples (includes duplicates of RBSFH fillet samples) were shipped to SGS AXYS analytical on April 1, 2019 for Per- and polyfluoroalkyl substances (PFAS) analysis. Compounds reported by SGS AXYS include: PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFNA, PFDA, PFUnA, PFDaA, PFBS, PFHxS, PFOS, and PFOSA. Compounds in tissue were quantified using AXYS method MLA-043 which is an isotopic dilution method via HPLC/MS-MS. Detection limits are provided below (Table 3).

RESULTS:

A table of the data is provided below along with some summary graphs. Results for **metals** are reported in mg/Kg (parts per million) wet weight and for **PFAS**, ng/g (parts per billion) wet weight.

- **The results of the PFAS analysis for the Ruth Burnett Sport Fish Hatchery samples are NOT included in Figure 6 and Table 2 below because they were all non-detect for all PFAS compounds tested and there are no levels to report.** PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFDA, PFUnA, PFDaA, PFBS, and PFOSA were not detected in any sample analyzed.

For comparison, heavy metal results for other samples analyzed by the Fish Monitoring Program (FMP) are included. See our website: <http://dec.alaska.gov/eh/vet/fish-monitoring-program> for further information about contaminants in fish and shellfish from the State of Alaska.

Fish consumption guidelines for Alaska can be found at <http://dhss.alaska.gov/dph/Epi/eph/Pages/fish/default.aspx>

Site Polaris Lake Ruth Burnett Sport Fish Hatchery

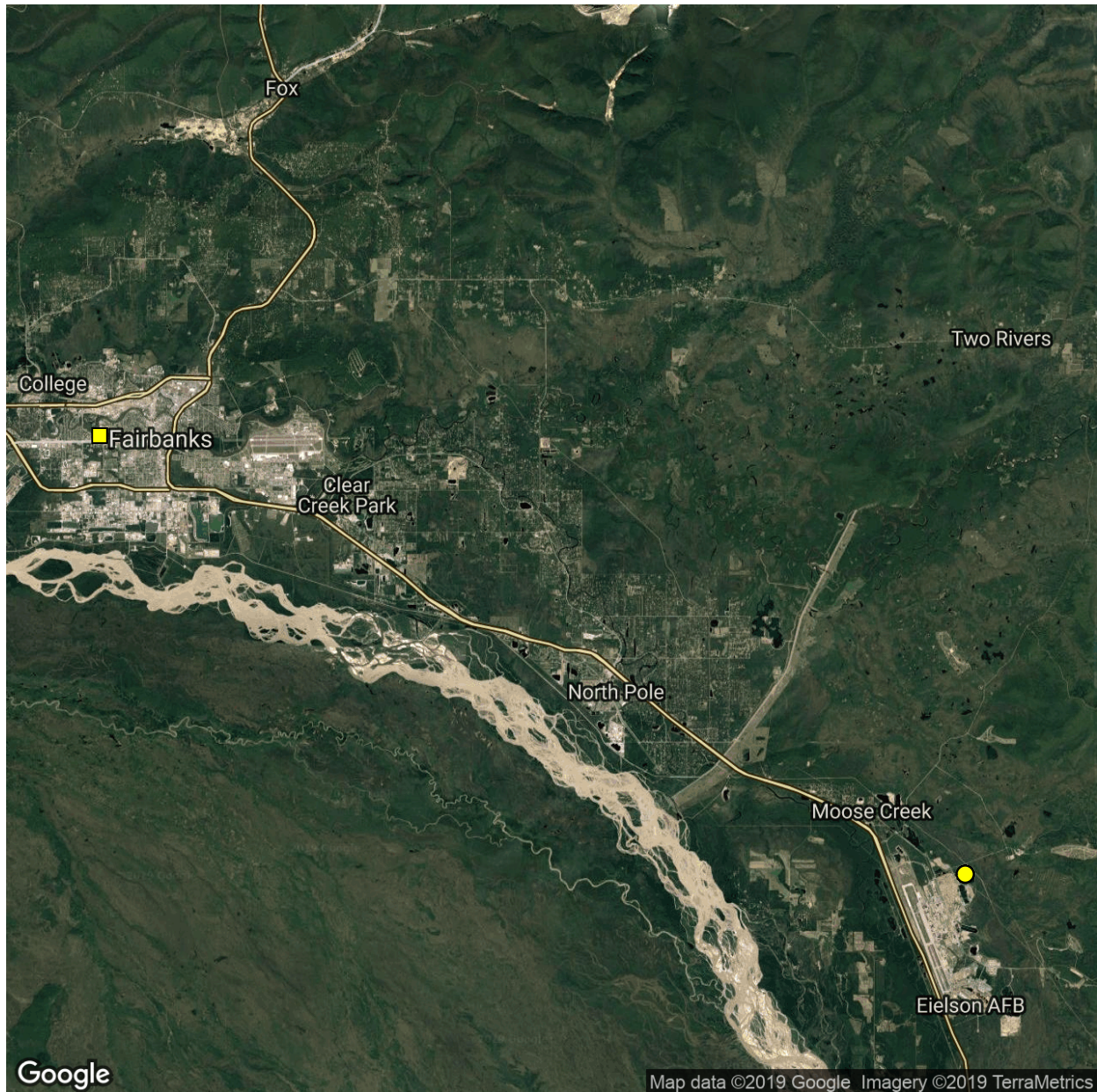


Figure 1: Sample Locations

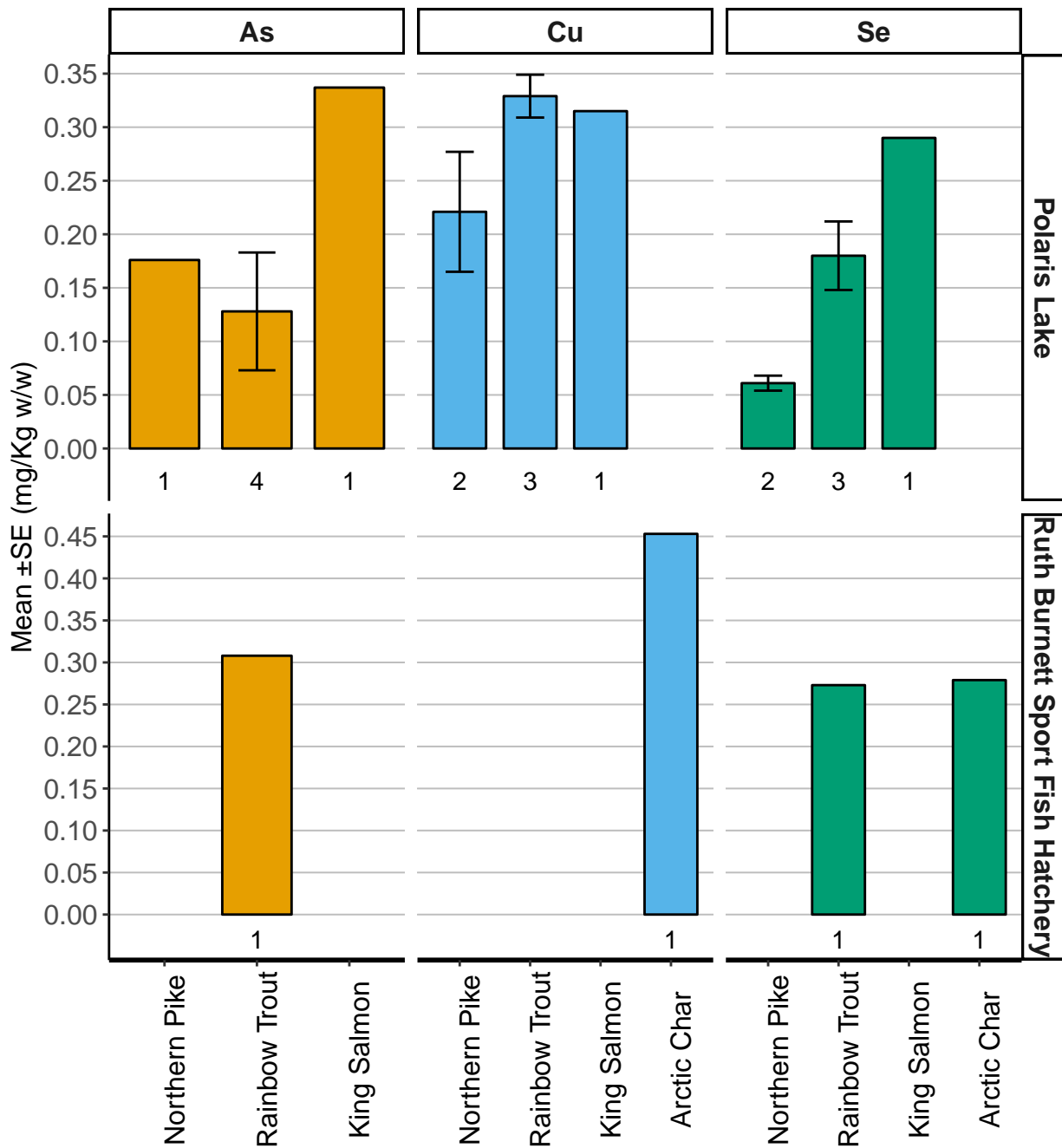


Figure 2: Heavy Metals in Fish Samples Submitted. Cd and Pb were not detected and are not included

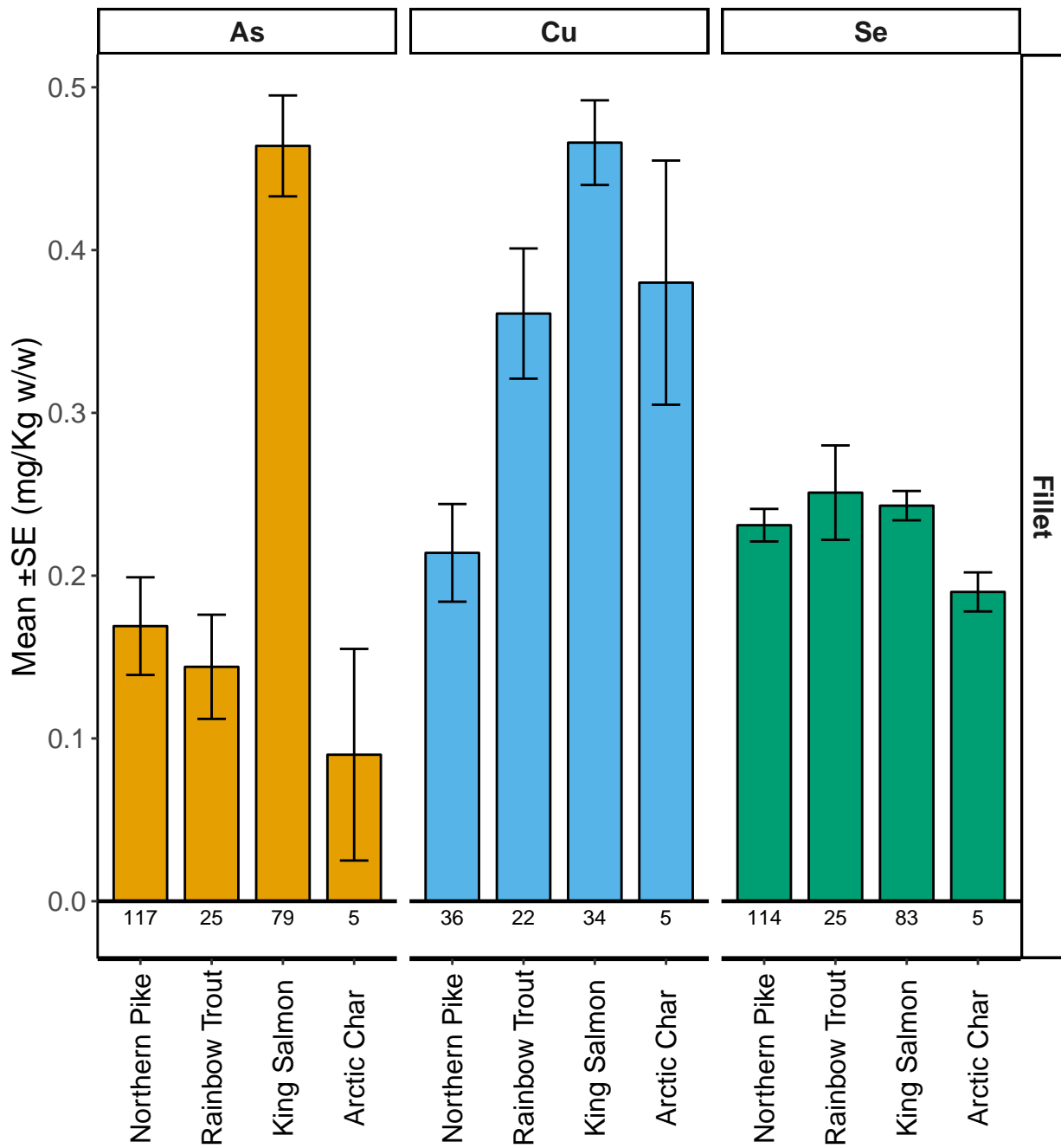


Figure 3: Heavy Metals in Select Fish from the Fish Monitoring Program

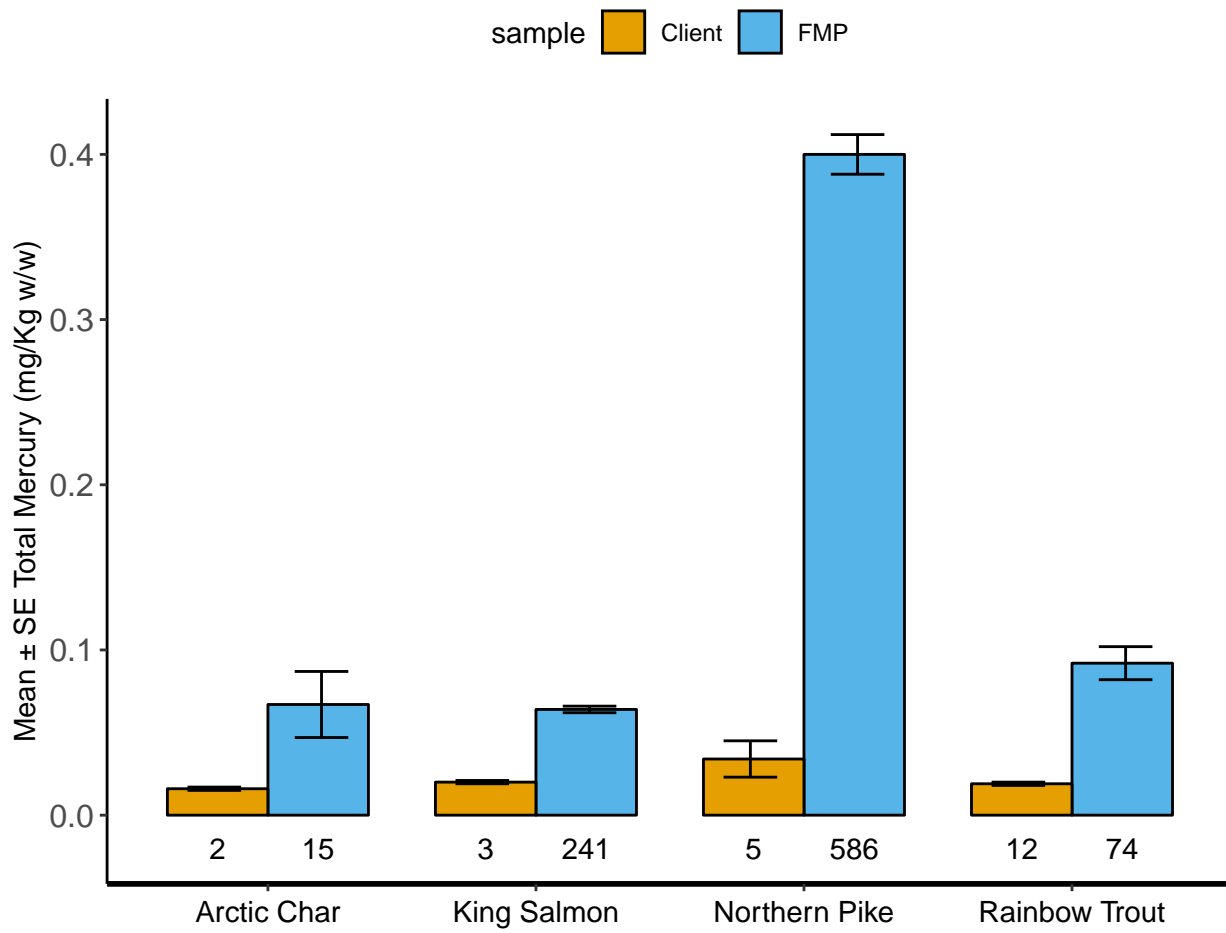


Figure 4: Mean Total Mercury for Client Samples and FMP Samples

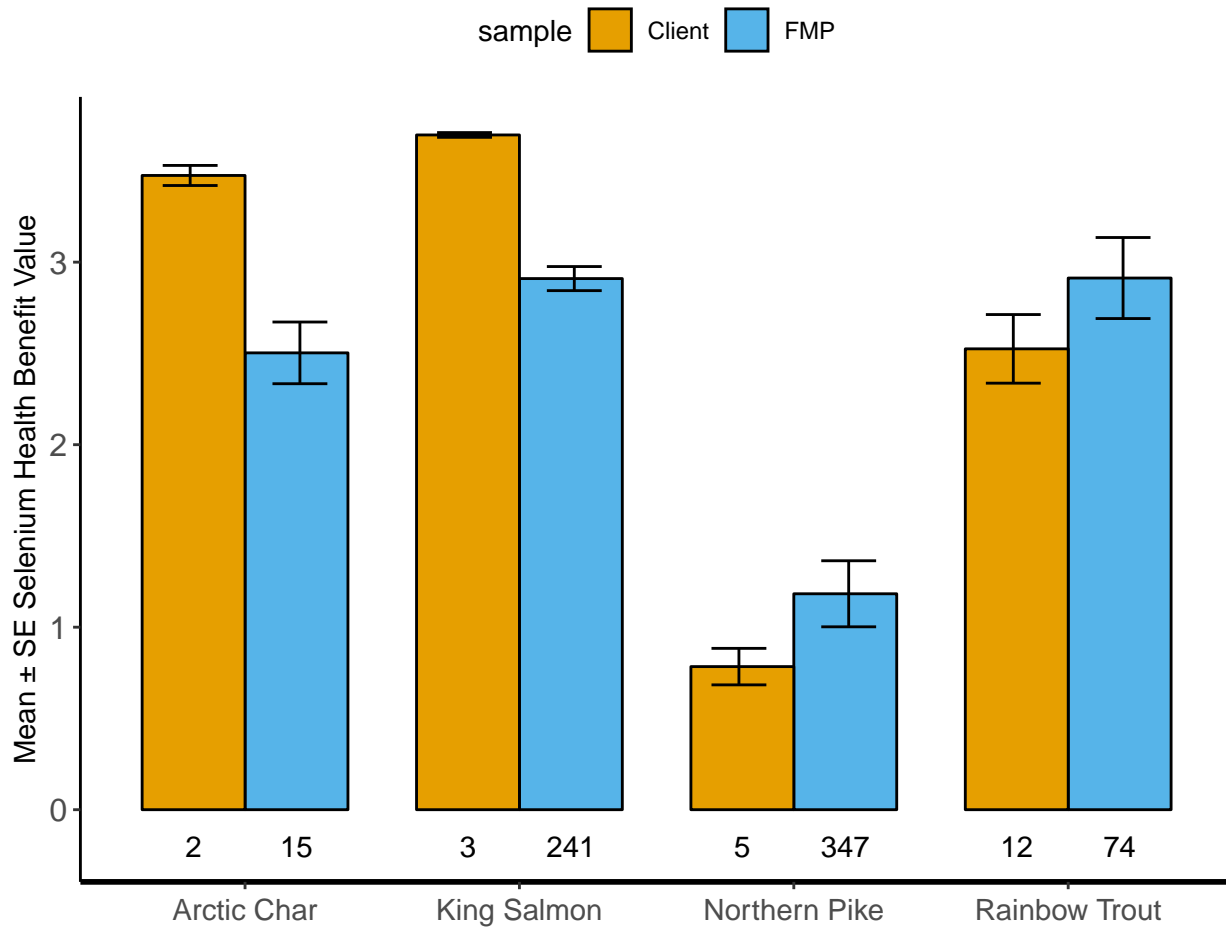


Figure 5: Mean Selenium Health Benefit Values for Client Samples and FMP Samples

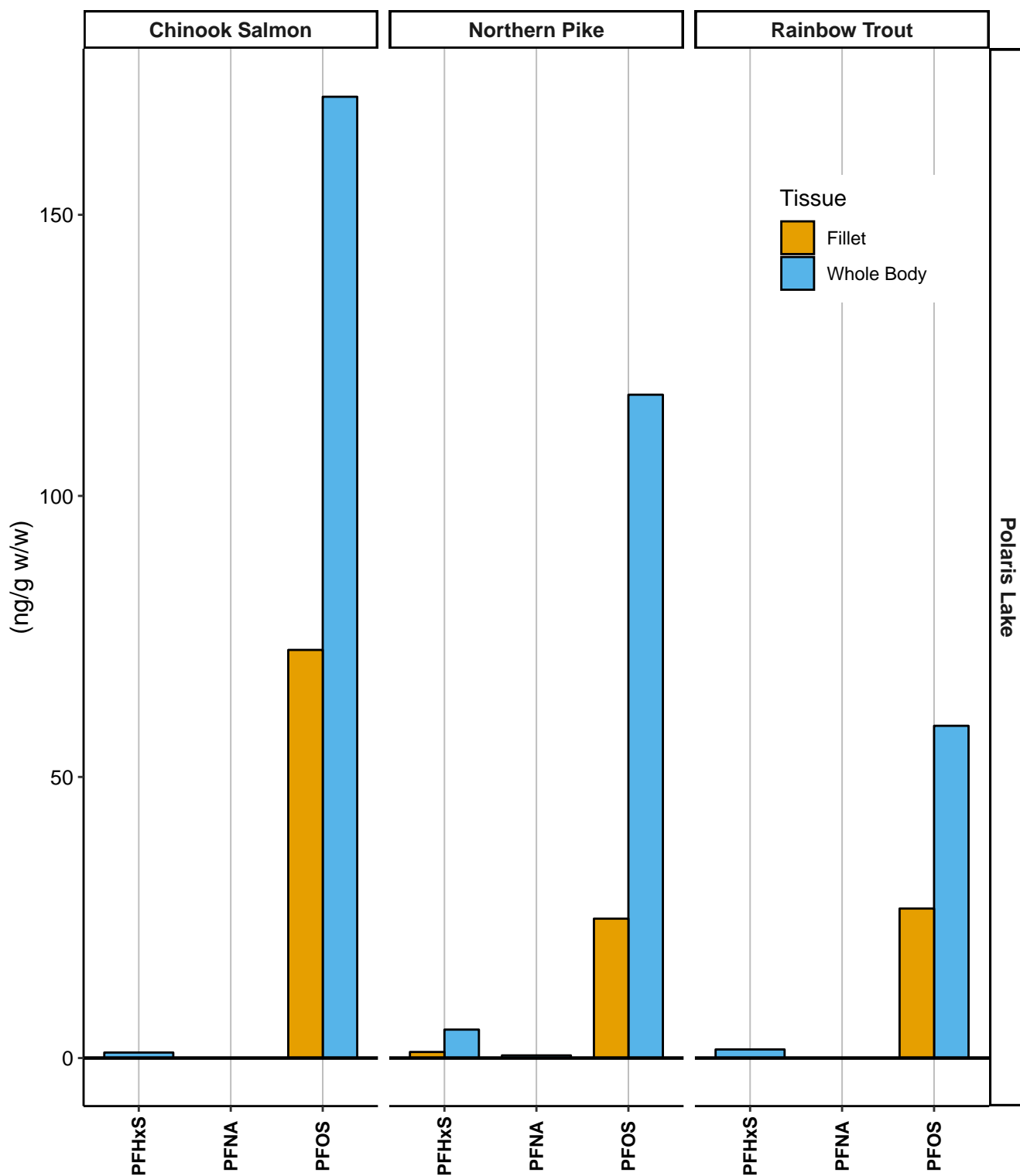


Figure 6: Per- and polyfluoroalkyl substances in Composite Samples of Three Fish Species Collected From Polaris Lake. PFAS compounds that were not detected are Not included.

Table 1: Table of Select Metals in Fillet Tissue from Fish Collected from Polaris Lake and Ruth Burnett sport Fish Hatchery

Species	Analyte	Site	n	ND	Mean	SD	SEM	Median	Min	Max
Northern Pike	As	Polaris Lake	5	0	0.249	0.209	0.094	0.164	0.138	0.622
Northern Pike	Cd	Polaris Lake	5	5	ND	NA	NA	ND	ND	ND
Northern Pike	Cu	Polaris Lake	5	0	0.221	0.055	0.025	0.25	0.157	0.277
Northern Pike	Pb	Polaris Lake	5	5	ND	NA	NA	ND	ND	ND
Northern Pike	Se	Polaris Lake	5	0	0.066	0.018	0.008	0.059	0.053	0.096
Northern Pike	Hg	Polaris Lake	5	0	0.034	0.025	0.011	0.026	0.014	0.075
Rainbow Trout	As	Polaris Lake	10	0	0.126	0.099	0.031	0.09	0.037	0.294
Rainbow Trout	As	Ruth Burnett Sport Fish Hatchery	2	0	0.315	0.01	0.007	0.315	0.308	0.322
Rainbow Trout	Cd	Polaris Lake	10	10	ND	NA	NA	ND	ND	ND
Rainbow Trout	Cd	Ruth Burnett Sport Fish Hatchery	2	2	ND	NA	NA	ND	ND	ND
Rainbow Trout	Cu	Polaris Lake	10	0	0.332	0.038	0.012	0.343	0.265	0.395
Rainbow Trout	Cu	Ruth Burnett Sport Fish Hatchery	2	0	0.422	0.009	0.007	0.422	0.416	0.429
Rainbow Trout	Pb	Polaris Lake	10	10	ND	NA	NA	ND	ND	ND
Rainbow Trout	Pb	Ruth Burnett Sport Fish Hatchery	2	2	ND	NA	NA	ND	ND	ND
Rainbow Trout	Se	Polaris Lake	10	0	0.186	0.045	0.014	0.17	0.142	0.255
Rainbow Trout	Se	Ruth Burnett Sport Fish Hatchery	2	0	0.266	0.01	0.007	0.266	0.259	0.273
Rainbow Trout	Hg	Polaris Lake	10	0	0.018	0.004	0.001	0.018	0.014	0.024
Rainbow Trout	Hg	Ruth Burnett Sport Fish Hatchery	2	0	0.021	0.001	0.001	0.021	0.02	0.022
King Salmon	As	Polaris Lake	3	0	0.355	0.048	0.028	0.337	0.318	0.409
King Salmon	Cd	Polaris Lake	3	3	ND	NA	NA	ND	ND	ND
King Salmon	Cu	Polaris Lake	3	0	0.351	0.064	0.037	0.315	0.312	0.425
King Salmon	Pb	Polaris Lake	3	3	ND	NA	NA	ND	ND	ND
King Salmon	Se	Polaris Lake	3	0	0.292	0.002	0.001	0.293	0.29	0.293
King Salmon	Hg	Polaris Lake	3	0	0.02	0.002	0.001	0.02	0.019	0.023
Arctic Char	As	Ruth Burnett Sport Fish Hatchery	2	0	0.346	0.004	0.003	0.346	0.344	0.349
Arctic Char	Cd	Ruth Burnett Sport Fish Hatchery	2	2	ND	NA	NA	ND	ND	ND
Arctic Char	Cu	Ruth Burnett Sport Fish Hatchery	2	0	0.47	0.024	0.017	0.47	0.453	0.487
Arctic Char	Pb	Ruth Burnett Sport Fish Hatchery	2	2	ND	NA	NA	ND	ND	ND
Arctic Char	Se	Ruth Burnett Sport Fish Hatchery	2	0	0.274	0.006	0.005	0.274	0.27	0.279
Arctic Char	Hg	Ruth Burnett Sport Fish Hatchery	2	0	0.016	0.001	0.001	0.016	0.015	0.016

Note:

Ruth Burnett Hatchery samples are composites of 20 fish (sample and duplicate)

ND = non-detect

Mean = arithmetic mean

SD = standard deviation

SEM = standard error or mean

Reporting limits: As, Cd, Cu, Pb = 0.05 mg/Kg; Se = 0.25 mg/Kg; Hg = 0.01 mg/Kg

Table 2: Per- and polyfluoroalkyl substances in Composite Samples of Rainbow Trout, Northern Pike, Arctic Char, and Chinook Salmon

Site	Species	Tissue	Fish in Comp.	COMPOUND	n	Conc (ng/g)
Polaris Lake	Chinook Salmon	Fillet	3	PFOS	1	72.60
Polaris Lake	Chinook Salmon	Whole Body	3	PFHxS	1	0.98
Polaris Lake	Chinook Salmon	Whole Body	3	PFOS	1	171.00
Polaris Lake	Northern Pike	Fillet	5	PFHxS	1	1.08
Polaris Lake	Northern Pike	Fillet	5	PFOS	1	24.80
Polaris Lake	Northern Pike	Whole Body	5	PFHxS	1	5.06
Polaris Lake	Northern Pike	Whole Body	5	PFNA	1	0.47
Polaris Lake	Northern Pike	Whole Body	5	PFOS	1	118.00
Polaris Lake	Rainbow Trout	Fillet	10	PFOS	1	26.60
Polaris Lake	Rainbow Trout	Whole Body	10	PFHxS	1	1.53
Polaris Lake	Rainbow Trout	Whole Body	10	PFOS	1	59.10

Note:

Only samples with detectable levels are included in the table

Fish in Comp. = The number of fish used to make a composite sample

Table 3: Detection Limits of Per- and polyfluoroalkyl substances

COMPOUND	Mean	SD	Median
PFBA	0.467	0.022	0.463
PFBS	0.934	0.044	0.926
PFDA	0.467	0.022	0.463
PFDoA	0.467	0.022	0.463
PFHpA	0.467	0.022	0.463
PFHxA	0.467	0.022	0.463
PFHxS	0.934	0.044	0.926
PFNA	0.467	0.022	0.463
PFOA	0.467	0.022	0.463
PFOS	0.934	0.044	0.926
PFOSA	0.677	0.504	0.468
PFPeA	0.467	0.022	0.463
PFUnA	0.467	0.022	0.463

Note:

Units = ng/g wet weight

Mean of all samples analyzed for this report (n = 12)